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ABSTRACT

The Aural Study System was devised for visually handicapped elementary and secondary school students to learn more efficiently through listening rather than reading, and was tested in two field trials. Components included a record player, a foot control, records in textbook format, written material, and a written key for locating textual pages on the record. The textual unit was from A Global History of Man, by L. Stavrianos and others (editing procedures explained). Results of the first field trial, a 30 task test on locating and operating components, indicated that 94% of the 32 Ss in grades 5 to 12 located the place of a specific topic in the recorded test (the most difficult task); however, some of the problems Ss encountered were amplifier and further technological failure, and confusion in use of hand or foot control. Results of the second trial, to ascertain whether braille students could use the system for common study tasks, showed that all 24 Ss in grades 9 to 12 wrote some responses in braille to four study tasks (answering question, copying quotation, and outlining and summarizing text sessions), that 11 to 15 Ss performed adequately or better, that in addition to problems encountered in the first field trial, other problems were Ss' inability to judge distances, or poor alphabetizing, listening, spelling, and memory skills. Conclusions were that students could use the system after receiving more instructions and after refinements were incorporated in the system. Appended are equipment and materials checklists and study questions, functional level and educational level tests, the training program, and a subject data sheet. (MC)

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INTERIM PROGRESS REPORTS

Project No. 8-0046
Grant No. OEG-0-8-080046-2670(032)

AURAL STUDY SYSTEMS FOR THE VISUALLY HANDICAPPED

No. 9 Description of the Aural Study System
June E. Morris, Carson Y. Nolan,
and Bobby G. Phelps

No. 10 Field Trial of the Aural Study System
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and Roy J. Brothers

American Printing House for the Blind, Inc.
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Louisville, Kentucky 40206

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Department of Health, Education, and Welfare

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Bureau of Education for the Handicapped

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Preface

In 1968 when the series of studies undertaken in the Aural Study Systems for the Visually Handicapped project was initiated, research evidence existed indicating that, generally, listening was a more efficient way for a visually impaired person to study than reading. In the ensuing five years, major research evidence has accrued to reinforce this conclusion.

At that time a disc study system was selected for development rather than a tape system for the reason that it appeared to be the mode that would provide for most efficient use. Although the "state of the art" for tapes has changed during the interim years, the fact still remains that all tape systems are linear ones and, therefore, not amenable to rapid search. If a sought topic is located near the end of a tape, it may take the user 5 minutes to just run the tape through to the appropriate place; whereas, with a disc system a user need only set the stylus down near the end of the record, a matter of 2 or 3 seconds. Today, in 1973, no means for fast search yet appears possible for tape systems. Therefore, it appears that disc systems will continue to have this advantage.

The Aural Study System developed in this project contained many special features previously identified as being necessary if a visually handicapped student was to be able to use recorded materials efficiently as a means for study. These included two indexing capabilities; one for gross search and the other for fine search. Used in combination, any desired place on a record can be located within a short period of time. The system, as initial built, critiqued, and modified, was subjected to a two phased field trial during which it became evident that school students could learn to operate the system and use it to perform study tasks.

During the field trial, information was obtained concerning modifications that should be made on subsequent generations of the Aural Study System. These changes would refine it and provide for more efficient use. Also noted was the continuing need for information on how to study from aural materials. Currently, no such materials exist for visually handicapped students that are specific to their particular needs. Such information should be pragmatic in orientation. It should not only suggest general ways to listen to increase comprehension, but be quite specific in suggesting techniques for use in accomplishing study tasks. Only when such materials become available will visually handicapped students have the opportunity to use aural materials with maximum effectiveness.

Many persons and organizations have contributed to the development of the Aural Study System and to its initial evaluations. Mr. Glenn Scheurich, head of the Talking Book Department at the American Printing House for the Blind, has enthusiastically promoted the project and been instrumental in its progress since its inception. One of his special technicians, Mr. John Baughman, has worked diligently with the project engineer in the construction of the unique record player involved as well as the production of the accompanying records. Throughout the project, Printing House staff have participated selflessly in the planning of the project and the production of the materials.

Special permission was granted by Allyn and Bacon, Inc. to use material from one of their publications for the recording.

Evaluation of the final working model of the Aural Study System was made possible through the wholehearted cooperation of Mr. D. A. Hutchinson, Superintendent of the Indiana School for the Blind at Indianapolis, and Mr. D. W. Overbeay, Superintendent of the Ohio State School for the Blind at Columbus, and their respective staffs and students.

To all of these persons, acknowledgment of their assistance is but a small token of appreciation to offer in return for their participation in the project. Hopefully, the real payoff will be to the students of the future.

Interim Progress Report

No. 9

Project No. 8-0046

Grant No. OEG-0-8-080046-2670(032)

Aural Study Systems for the Visually Handicapped

Description of the Aural Study System

June E. Morris, Carson F. Nolan
and Bobby G. Phelps

American Printing House for the Blind, Inc.

Louisville, Kentucky

30 April 1973

The research reported herein was performed pursuant to a grant with the Bureau of Education for the Handicapped, U. S. Office of Education, Department of Health, Education, and Welfare. Contractors undertaking such projects under government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official position of the Bureau of Education for the Handicapped.

Department of Health, Education, and Welfare

U. S. Office of Education
Bureau of Education for the Handicapped

Research and development of the Aural Study System originated because of the senior authors' concern over the long standing problem of slow reading rates for visually handicapped students. A frequently quoted median silent visual reading rate for senior high school students is 251 words per minute (Harris, 1970). Comparable reading rates for braille and large type users are much slower. Studies (Nolan, 1966) of reading rates of high school students for literary, social studies, and science materials show mean rates for braille users ranging from 65-74 words per minute (wpm) and mean rates for legally blind large type readers ranging from 80-86 wpm. These rates were based on the reading of 2100 word passages of appropriate grade level difficulty under study conditions. The figures empirically substantiate the fact that the reading deficit suffered by readers of large type is practically as severe as that of readers of braille.

Use of auditory instead of written media appears one method of partially offsetting the learning deficits resulting from severely disparate communications rates among the visually handicapped and the sighted. For example, recorded books produced by the American Printing House for the Blind (APH) routinely play at speeds of 175 wpm. In use, this rate can be increased through playing recordings at a faster rate or through applying speech compression techniques (Foulke, 1966).

For the visually handicapped, learning achieved through use of recorded textbooks compares quite favorably with learning attained through reading braille or large type (Lowenfeld, 1945; Morris, 1966; Nolan, 1966). In a series of studies involving both elementary and high school students as subjects, the senior authors compared learning of literary, social studies, and science materials when presented in recorded form with learning of them when presented in braille or large type. No differences were found in overall learning between material read or heard for legally blind students. What was found was that learning through listening was much more efficient than learning through reading since 155-360% greater learning occurred from listening in terms of actual time spent in study. It was the results of these last studies that stimulated development of the Aural Study System.

Three studies were conducted to explore and define possible dimensions of such a system. The first (Morris & Nolan, 1969) explored problems in the use of recorded textbooks by legally blind students in the public schools of New Jersey. These students were interviewed intensively on curricular areas appropriate for recorded texts; environmental factors affecting study; and problems of equipment, textbook formats, and study techniques. The results of the interviews indicated many critical problems in use of recorded texts. Principal among these was the great incompatibility existing between playback equipment design, design of recorded textbooks, study techniques, and educational goals. The importance of active versus passive study habits was emphasized. Results of the interviews provided information for starting a task analysis of the job of studying using recordings.

A follow-up study (Morris & Nolan, 1970a) involved legally blind students attending the University of Texas. In this study students analyzed parts of textbooks for usefulness when recorded and described their own study methods. Eighty-three percent of the students expressed a preference for recorded texts with the exception of texts in mathematics, physical science, and certain languages which they felt were more easily understood in written forms. With respect to parts of books, recorded forms were preferred for prefaces and/or forewords, acknowledgements, introductions, footnotes, suggested activities, and main contents, while tables of contents, graphics, study questions, references, glossaries, and indexes were preferred in written form.

With respect to study methods, scheduling, understanding graphics, concentration, note-taking, place findings, and indexing were identified as critical areas in study through listening and methods for overcoming problems in these areas were suggested.

In 1970 a task analysis was completed of the job of study through listening using a disc system (Morris & Nolan, 1970b). These results, together with those already mentioned, revealed the inadequacy of the playback devices and record formats in use for efficient study. Many of the incompatabilities existing between playback equipment, recording formats, writing equipment, and the techniques students used were pinpointed. For example: it required two hands to operate a braille in note-taking, leaving no hands available to operate playback equipment as currently designed; more versatility in backward-forward search was needed; place finding was difficult; and random access or near random access appeared a necessity for efficient use of recorded texts and references.

The conclusions that can be drawn from the research findings reported include the need for visually handicapped students to utilize more rapid communication media for study, the potential that auditory media have to solve this problem, and the necessity of designing text formats, record players, and study techniques to fit the unique problems faced in aural study.

Purpose of This Study

The purpose of this project was to coordinate design of the various components of an Aural Study System to meet the needs of the visually handicapped. This required the development or designing of a special textbook format appropriate for use with recorded textbooks, the development of a record player and records designed to provide the special features previously identified as desirable for aural study, and the design and development of a written supplement to accompany the aural material. As much detail as possible was specified in the physical and/or operational characteristics of the three components of the system.

Procedure

Initial Design

Specifications were generated based on information from the general literature, information derived from the several studies described, and discussion of this information with educators, blind persons, and members of the technical staff of the Talking Book Department at APH. The final specifications called for development of a special player, special recorded text, and written supplement to the text.

At the time work commenced on the Aural Study System it was decided to initially develop it as a disc system. There were four reasons for doing so: first, it appeared that a disc system would provide for more efficient use than a tape system; second, APH had a greater production capacity for discs than tapes; third, discs had a cost advantage at that time of approximately 4.5:1.0 over tapes; and fourth, there was an industry wide problem concerning quality control of tapes.

Design of a model text (recording and written supplement) was the responsibility of the senior author with assistance from the second author. Technical assistance was provided by the technical recording staff. The design involved modification of textbook format, editing, and the preparation of additional materials. Following initial design, a test recording was made and reproduced in disc form and a written supplement was prepared in braille.

An initial working model of the player was designed and built by APH recording engineers under the direction of the junior author who was the project engineer. Design was coordinated with the project staff as problems were encountered.

Expert Review

An expert review panel was selected of four blind users of recordings who were also experts in the fields of education, rehabilitation, or psychology. Participants in the review were Dr. Emerson Foulke, University of Louisville; Mr. Fred Gisson, Kentucky Department of Rehabilitation; Dr. George Gore, III, Michigan State University; and Dr. Arthur Lown, Atlanta Public Schools.

Each participant was sent a copy of the written supplement in advance of his visit to APH to view the Aural Study System as a whole. This was done so that he might become familiar with the content prior to his visit. Upon arrival at the Printing House, each participant was individually instructed in use of the system and given ample opportunity to practice with it. Instruction in use of the equipment was achieved through use of a written familiarization program. This was done to insure that the instruction be specific, thorough, and systematic. Following the practice period, each participant was questioned, in detail, as to his observations and suggestions for the various individual features of the player, the foot control, the record, and the written supplement. In addition, general comments were solicited.

In-house Review

Not all of the suggestions made by the reviewers were compatible, nevertheless, all were compiled and reviewed by members of APH's staff. This was done by two in-house review panels. The first of these concerned itself with the equipment and the record. Members of this panel included the project engineer and others familiar with recording equipment along with members of the research staff who had been involved in determining the specifications for the Aural Study System and in obtaining the critiques of it. The second in-house panel, comprised of members of the research staff who had worked on the project, concerned itself with reviewing suggestions made for the written supplement. In all cases the feasibility of the various suggestions was weighted and decisions made as to what modifications would be desirable.

Modifications

Modifications agreed upon fell into two general categories: those to be incorporated in the working model of the system designed for field trial and those to be incorporated into the system at the stage where a production model was required. Among the latter were such things as reducing the size and weight of the record player, possibly redesigning the foot control to make it smaller, and improving the quality of the maps contained in the braille supplement.

Subsequent to this, the first working model of the system was modified as agreed upon and three additional working models constructed. The system consisted of the following: (a) a record player especially designed to accomplish the study tasks identified through previous research, (b) an especially designed record providing semi-random access which was recorded in a specially defined format, and (c) a written supplement containing those parts of the text that previous research had identified as best for study in written form.

Textbook Format

Editing of the text was an intrinsic step in preparation of the software components (the record and the written supplement) of the Aural Study System. The text material had to be edited to indicate how it was to be read. At the same time, certain material had to be extracted for inclusion in the written supplement. This latter included such things as words that were to be spelled on the recording and would also appear in spelling lists in the written supplement; study questions; and a listing of all graphics that would need to be reproduced for inclusion in the written supplement. Numbering of the individual supplements was an important step in the editing process as reference to individual supplements was recorded within the text and was in terms of supplement number.

Editing

Material found in textbooks is organized and presented in a variety of ways. Analysis of several textbooks identified 14 parts that occur in some, though not all, textbooks (Morris & Nolan, 1970a). The

parts identified were: prefaces and or forewords, acknowledgements, tables of contents, introductions, text, graphics, footnotes, study questions, suggested activities, bibliographies and/or references, appendixes, glossaries, indexes, and notes. Within each of these broad categories finer breakdowns could be made. For instance, separate tables of contents sometimes appear for the main sections of the total book (e.g., units, chapters, etc.) and for special parts of the book (e.g., tables, demonstrations and experiments, etc.). Introductory material may fall into a variety of categories such as general to the text, specific to a unit, or specific to a selection. The text itself is the most variable.

Before a textbook is recorded it needs to be carefully edited and the reader given precise instructions if the recorded version is to be of maximum usefulness. The edited material needs to be marked in such a way that, as the reader records it, he will know exactly what to do in all instances. Using information obtained from the student interviews (Morris & Nolan, 1970a; Nolan, 1966) and the task analysis (Morris & Nolan, 1970b) as guidelines, rules for editing and reading were determined. The unit from A Global History of Man (Stavrianos, Andrews, Blanksten, Hackett, Leppert, Murphy, & Smith, 1962) used for the experimental recording was then edited accordingly. This involved a number of steps.

Page numbers. Page numbers were inserted to indicate ink-print pages as each new page was encountered. Students need this information as the table of contents, the index, and class assignments, usually, are in terms of pages. Page numbers were announced simply as "page ____." Three rules were followed in determining their placement. First, page numbers were inserted between sentences only. Second, page number insertions normally either followed the last full sentence on a page or immediately preceded the first whole sentence on the following page. Third, an effort was made to avoid interrupting a thought with the placement of page numbers. Occasionally adherence to the latter rule would override adherence to the second.

Where a map occurred on a page, at the same time the page announcement was made, map information was given also; for example, "Page ____. Part of (The whole of) page ____is devoted to a map of (name of map). See supplement number ____." Similar information was given for charts and graphs. Reference to the supplement presenting the only table included in the experimental recording occurred within the text rather than at the page break; however, might have been given at the page break instead. Where a whole page was covered by a picture the announcement made was, "Page ____. The whole of page ____is devoted to a picture illustration." This was done so that a user would not think a page had been skipped. Where a picture covered just part of a page, no reference was made to it. No illustration was named or described.

Picture captions and legends. Picture captions and legends were carefully reviewed. Where they contained information they were edited to remove extraneous material and an appropriate place within the text selected and marked for their insertion. Parts or wholes to be omitted

were marked out. Where caption or legend material was to be read with the text on a page other than where it occurred, cross-referencing was necessary.

Graphics. All graphics were marked out and noted, "Do not read."

Vocabulary. Vocabulary items might include new words, proper names, or important foreign words. Such words might be specific to the text or general. In editing the unit from A Global History of Man, vocabulary items were underlined the first time they appeared to indicate the reader should spell them, and they were listed so that they would be included in spelling lists which were a part of the written supplement.

Footnotes. Footnotes were read with the text where they occurred. The text was edited so the reader would say "note" at the start and "end of note" at the close of each.

Quotations. A problem students have reported in the use of recorded material is in knowing exactly what is included in quotations. Consequently, the word "quote" was inserted to immediately precede quotations and "end of quote" inserted at the finish. An interruption in a quotation was noted by saying "close quote" and "quote" at the appropriate places to clearly indicate the interruption.

References. These were indicated by saying, "See supplement number ____, ____ reference." In this case, the references were numbered. The form of the notation would need to vary according to how references were handled within the text and in the reference list. The prime consideration should be to give the student enough information to enable him to find any reference being sought easily.

Study questions. The position of the study questions was changed in the experimental recording. With the intent of providing a frame of reference for the user, the study questions that followed each of the main sections of the unit were shifted to precede that section to which they pertained. The text was cross-referenced so that the reader would know exactly where they were to be read and, as they also appeared in written form in the supplement, a reference to the appropriate supplement was inserted. An example of one is, "Politics: The Paradox of Authority and Instability--The section on Reviewing the Essentials for this part of the unit, which appears on pages 406 and 407, can be found in supplement number 7-13. The section Explain, Identify, or Locate for this part, which appears on page 407, can be found in supplement number 7-14. They are read as follows:" The object of this editing was to supply full cross-referencing for the student and for the reader who had an additional note telling him where to insert the study questions and the page(s) on which they appeared in the text.

Table of contents. This should be edited so that page numbers correspond with the recording. As only one unit was contained in the experimental recording, the book's table of contents was not included.

Index. The index of a book is essential for a student. Consequently, all items in the book's index relevant to the unit used for the experimental recording were contained in the index provided in the written supplement. As the placement of page numbers in the recorded edition of the unit was not identical to their placement in the ink-print edition, editing of the index was necessary so that page number references corresponded with the recording. Also, as some picture captions were edited out, index references to these had to be deleted.

Unit activities, references, etc. These were not read and a note to this effect was made for the reader. What was read was a reference to the appropriate written supplement as, "See supplement number 7-30 for unit activities for unit seven, Latin America, which appears on pages 441 and 442 of text."

General. Editing was color coded. Notations on the copy made in red were to be read at the places indicated. Those in blue were just for the information of the reader. The latter included such things as instructions not to read a map.

References to visual phenomena that were inappropriate for the recorded edition such as, "Scenes like this one " in reference to a picture, were edited out or, in some cases, reworded.

The editing task included writing supplemental materials. Those to be recorded included an initial blurb telling what the recording contained, publisher information, and identifying the reader; side announcements; and page numbers for the index track. Additionally, a whole set of materials was needed for the written supplement. These included everything that was not copied verbatim such as the table of contents for the written supplement, the outline of headings, spelling lists, and headings for each of the individual supplements.

Instructions for Production of the Recording

Special instructions for the reader. Implicit instructions were given the reader, in written form, covering the various aspects of the editing previously described as it pertained to the reading of the material. In addition, instructions were given to insert a sound signal to immediately precede each page announcement for both the content and index material. The sound was obtained by pressing a button on a box containing the sounding device. The device was powered electrically rather than mechanically.

Special instructions for the recording engineer. The recording engineer was instructed on only one matter. That was where in the text to position the index bands on the record. For this, natural breaks in the text material were selected. The 11 parts resulting were not equivalent in length nor were they at linearly equidistant intervals on the record.

A problem of editing for the recording engineer was in positioning the page numbers on the index track to coincide with their position on the content track. An effort was made to position these so that the start of the page announcements on both tracks was identical.

Description of the Aural Study System

Record Player

Specifications for the record player were as follows:

- On-off control
- Volume control
- Tone control
- Speaker or headphone option
- Three-speed capability (8-1/3, 16-2/3, and 33-1/3 rpm)
- Variable speed control
- Forward and reverse turntable capability
- Turntable pause--for brief stops featuring instantaneous stop and start
- Multitrack operation
- Remote control for turntable operations
  - Fast forward
  - Fast reverse
  - Pause
  - Play
- Hand controls for turntable operations
  - Fast forward
  - Fast reverse
  - Pause

Tone arm

Retractable pickup cartridge incorporating a mechanism for positively identifying the record edge

Stylus pressure light enough to prevent record damage

Indexing capability

Stereophonic application having indexing information on one track to be scanned at 66-2/3 rpm and a content track to be used at 8-1/3 rpm--both tracks to occupy the same groove

A photoelectric sensing device in the tone arm to detect bands on a record and audibly indicate when, and therefore where, they occur

Original specifications for the player called for it to be small and lightweight so that it would be portable. This, however, was not feasible at this stage of its development because of the many operational features incorporated, and because it was more economical to use standard components in building the experimental models than having components especially made. Additionally, the cabinet used was hand built from wood and consequently heavier than a production model might be. Dimensions of the final working models were: height--9 inches, width--16 inches, length--18 inches. Weight was 31-1/2 pounds.

Fig. 1. Final working model of the record player.

A foot control was built to accompany the player. Dimensions of the foot control were: height--2-3/4 inches, width--5-1/8 inches, length--12 inches. Its weight was 3-1/2 pounds. The foot control determined four operations which could be selected by position of the foot, and which were indicated by detent-like action. When oriented with the cord at the toe end, the first position (toe down/heel up) was fast forward. Rocking the foot back, the next position was pause followed by play. The fourth position (heel down/toe up) was fast reverse. A cord attached the foot control to the left side of the player when engaged for use. A 12 prong plug was used to plug the foot control into the player. The prongs were arranged in a 4 x 3 grid. The top side of this plug was identified in braille to orient the plug for proper insertion. Use of the hand controls would override the foot control when it was engaged.

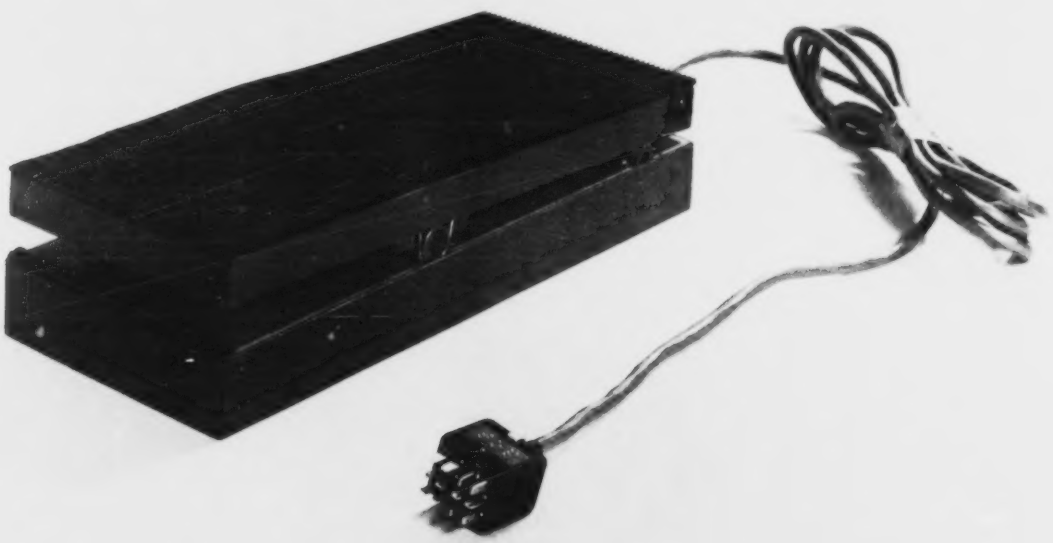

Fig. 2. Foot control and plug.

On the top deck of the player were located the turntable, slightly to the left of center, and the tone arm to the right of the turntable. The tone arm was of a type that moved horizontally across the record. It incorporated the photoelectric sensing device and the record edge finder, as specified, and was built to protect records from

accidental damage or scratching by the stylus while playing. This was possible because of its extreme lightweight; tracking weight of the stylus being only a few grams.

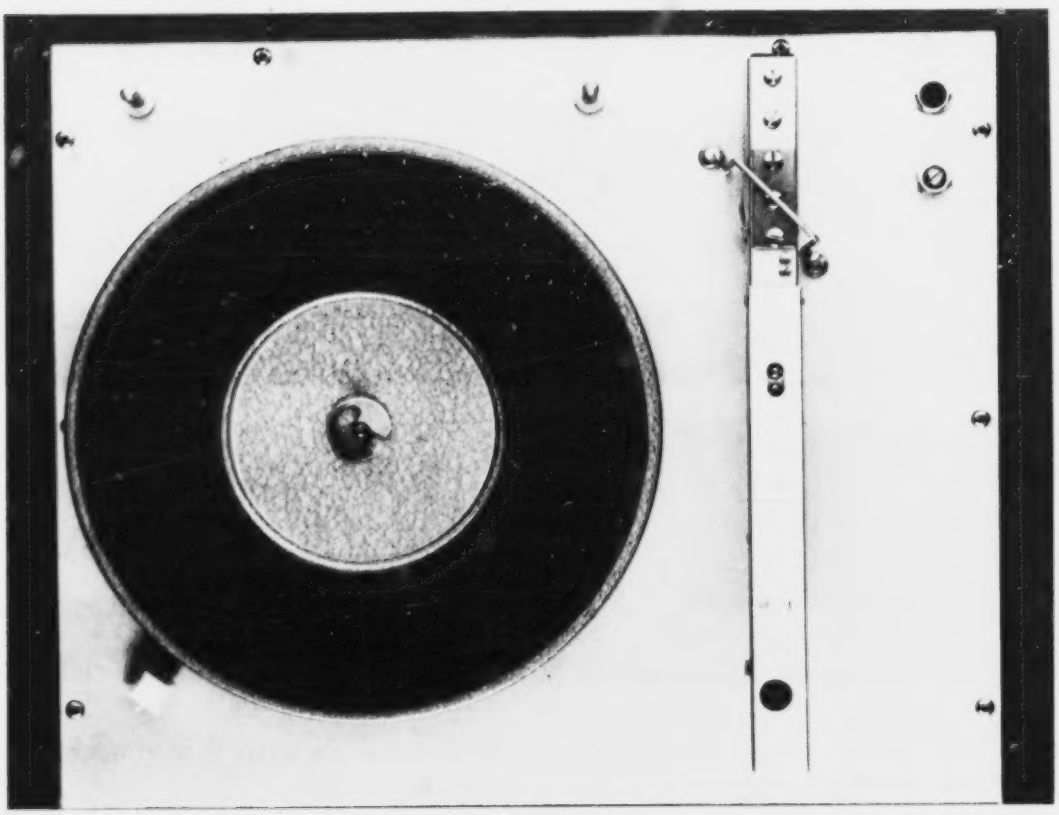

Fig. 3. Top deck of player.

On the top of the tone arm were located a lever which, when depressed, retracted the pickup cartridge and a small button emerging through a hole in the lever which, when depressed, became the record edge finder. The end of the lever extended 7/8 inch over the end of the tone arm. It was possible to depress the lever without activating the record edge finder; but, as the latter was depressed, the lever was also; thus automatically retracting the pickup cartridge. The purpose of retracting the pickup cartridge was so that the tone arm could be moved horizontally across the turntable or record. Having no vertical movement, this was necessary. The record edge finder was actually a rod which extended through the tone arm and the lever at its top with a button mounted on the top of the rod. When not depressed the rod did not extend below the tone arm; however, when depressed it did and thus acted as a bumper when it encountered the edge of a record as the tone arm was swung to the left.

The rod was positioned slightly to the right of the stylus so that when it contacted the edge of a record, the stylus would be slightly over the record. Then, when the button was released, the lever was also and the cartridge assembly was let down positioned to start playing the record.

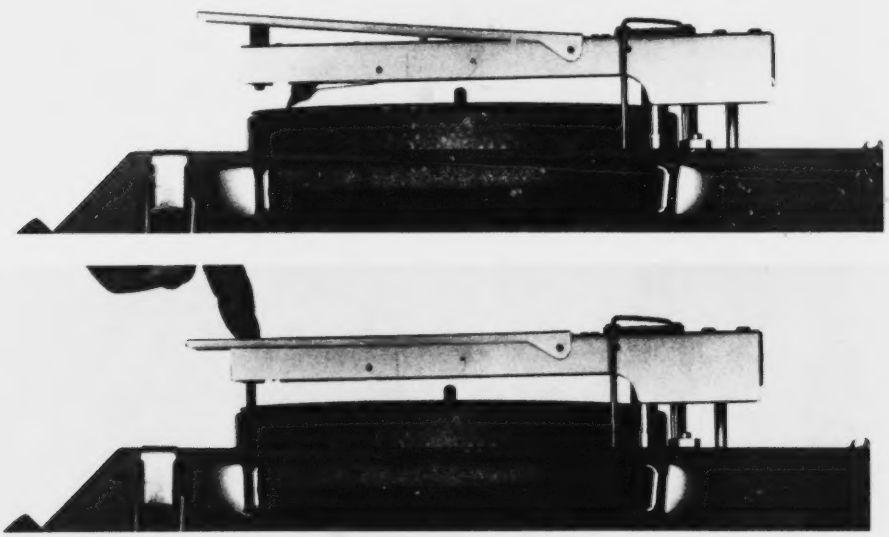

Fig. 4. (Top) Tone arm. (Bottom) Tone arm with record edge finder depressed.

Depression of the lever activated the photoelectric cell on the tone arm. When working, the light from this photoelectric cell was reflected back from the record by blank bands which served to divide the record into parts; the record being an especially made component of the Aural Study System. As the light was reflected back, an audible signal was activated thus enabling a blind user to locate the various bands on the record. While the photoelectric cell was activated, the stylus was retracted so that movement of the tone arm without contact with the record was possible. In proper use, a user would slowly move the tone arm across a record from the outside counting the audible signals as he went. When the desired band of a record was found, he would release the lever setting the stylus down on the record. This indexing mechanism worked with the record either moving or stationary. Components of the photoelectric sensing device were a focused light and a photoresistor mounted on the tone arm. When light was reflected off a band on a record to the photoresistor a signal was activated. This signal operated a relay which injected a tone or audible signal into the amplifier.

The tone heard on the speaker was provided by a 700 Hz oscillator.

A lever for setting turntable speed was located to the left of the turntable. Speeds obtainable as the user moved the lever clockwise away from him were: 8-1/3 rpm (first position--lever pulled all the way toward the user), stop (second position), 16-2/3 rpm (third position), and 33-1/3 rpm (fourth position--lever pushed to maximum distance from user).

An addition, two record guides were positioned to the left rear and right rear of the turntable.

At the right rear corner of the top deck was located the speaker jack. The speaker itself was built into the top lid of the player's cabinet and was detachable. If left on its hinges attached to the player, the speaker had to be propped against something, as a wall, there being no hinge locks. A short cord leading from the speaker had to be plugged into the speaker jack before the speaker could be used. A bracket on the inside of the lid at the side of the speaker was positioned to hold the tone arm parallel to the sides of the cabinet when the lid was closed.

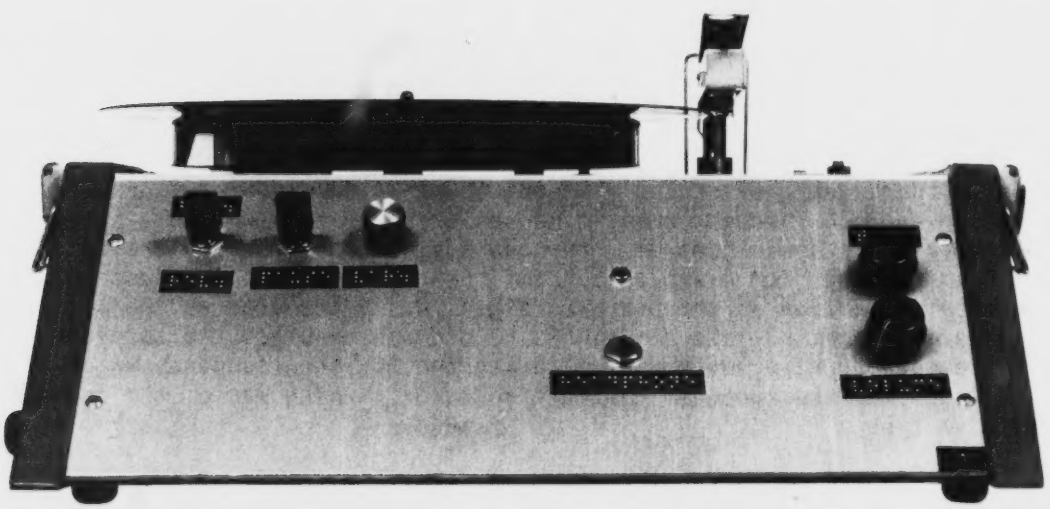

Fig. 5. Front panel of the player.

The front panel, or panel board, of the player contained five controls and a headphone jack. Names of the controls and jack were written in braille below each. The panel on which these controls were mounted was

slanted so that the upper part was farther from the user than the lower part; a 50° angle being formed by the base and the front panel. At the upper left of the panel was a toggle switch (fast forward-fast reverse control) that engaged fast forward when pushed up or fast reverse when pulled down. In either position it had to be held manually or it would automatically revert to normal. Forward and reverse turntable operations were achieved by driving the turntable by a second motor and disengaging the first motor. This was done by a switch and solenoids. With either of the fast search operations the turntable moved at a rate of 66-2/3 rpm and the index track of the record was engaged. Multitrack capability was achieved using a stereo technique to provide content and index material in the same groove. Content material was recorded in the left channel and index material in the right channel. By using a stereo cartridge, playback could be selected by means of a switch.

To the right of the fast forward-fast reverse control was a second toggle switch which, when pulled down, stopped the turntable when it was operating at any rate other than fast forward or fast reverse. This switch, called the pause control, locked into position leaving the user's hands free. The turntable pause, which occurred instantaneously, was achieved by applying DC voltage to the drive motor. This provided DC braking which served to stop the turntable. When the pause switch was released the restart was immediate.

To the right of the pause control was the variable speed control. This control was a knob that could be either rotated or pulled out and pushed in. Pulling the knob out engaged the variable speed mechanism. Pushing it in disengaged this mechanism. Using the variable speed control, the turntable speed could be increased half way to the next faster setting or decreased all the way to the next slower setting (e.g., if the turntable speed was set for 16-2/3 rpm, the range of speeds possible through manipulation of the variable speed control would be 8-1/3 to 25 rpm). Clockwise rotation increased the turntable speed; counterclockwise rotation decreased turntable speed. Through combined manipulation of the turntable speed lever and the variable speed controls, turntable speed could be controlled over a continuum ranging from 4-1/6 to 50 rpm. Being a mechanical adjustment, frequency distortion of the playback signal was introduced as the turntable speed varied from the rate at which a record was manufactured to play. The variable speed control worked by altering the AC line frequency which, in turn, regulated the speed of the turntable motor which was of the frequency sensitive type.

On the lower part of the front panel, slightly to the right of center, was the headphone jack. Plugged in this position, the headphone cord would not interfere with use of any of the player's controls.

At the lower right hand corner of the front panel was the volume control which was a knob that also controlled the power for the player. When turned all the way counterclockwise the power was off. As the knob was turned clockwise the power was turned on initially and then the volume was increased as the knob turned. Immediately above the volume control was a similar knob that controlled the tone. Counterclockwise rotation of the tone control progressively lowered the frequency (increased the bass quality) of the output while clockwise rotation progressively raised the frequency (increased the treble quality).

Expert review of the player resulted in several suggestions for changes that were not incorporated in the working model. These included such things as reducing the size and weight of the record player and redesign of the foot control to make it smaller and to make its stops more positive.

Experimental Recording

Record. Specifications for the record were as follows:

Sides labeled

Divided into parts

Recorded stereophonically

Content track

Index track

Index information calibrated with content information

The experimental recording made as a component of the Aural Study System was of a unit on Latin America taken from a world history book (Stavrianos, et al., 1962) of tenth through twelfth grade difficulty. It was recorded in the studios of the APH by Mr. Livingston Gilbert, a professional reader in the Talking Book program. The unit was contained on two sides of a 12-inch record recorded at 8-1/3 rpm. This represented 67 pages of the ink-print edition. The record labels contained information regarding sides and parts; namely, "side 1 parts 1-6" and "side 2 parts 7-11."

Fig. 6. Experimental recording showing bands.

Narrow bands about 1/16 of an inch wide divided the experimental recording into 11 parts; 6 parts being on side one and 5 being on side two. These bands had a single groove leading through them so that the stylus would be led from the end of one part to the start of the next part without physical intervention by the user. Natural breaks in the text were used to determine parts of the record. The purpose of the bands was to facilitate search. Actually, they were just unrecorded areas which would reflect light back to the tone arm when the photoelectric cell was in use thereby activating the audible sound signal which enabled a blind user to find a desired part. The outside edge of the record, being an unrecorded area, served as the first band and introduced the first part. The next band, moving inward, served as the second band and introduced the second part, etc. The center part of the record, being unrecorded, caused a continuing audible response and, therefore, was easily recognizable.

The record itself was cut stereophonically, meaning that within each groove there were two tracks. Unlike commercial record players which play both tracks simultaneously, the player accompanying the Aural Study System was constructed to play the two tracks individually. Therefore, different information could be, and was, provided on the two tracks of the record. On one track, called the content track, the text material was recorded at the rate of 8-1/3 rpm. Page numbers were read at appropriate places within the text. On the second track, called the index track, index information was recorded at the rate of 66-2/3 rpm--eight times faster than the content track in order that it might be scanned rapidly. Index information contained on the index track of the experimental recording consisted of page numbers; however, it could have been any kind of pertinent information. When the record player was operated at either fast forward or fast reverse it automatically switched from the content track to the index track and played at the appropriate rate. Running at fast forward page numbers were clearly heard. These were positioned to coincide with like pages on the content track. When a desired page was located on the index track, play could be immediately returned to the content track where the recording of that page would be heard. Page numbers on both tracks were preceded by a sound signal used to alert the listener. When operated at fast reverse, page announcements could be heard but were unintelligible.

Text for the experimental recording was carefully edited as described in the section on textbook format.

Although during the critique some changes were suggested for the content of the recording, it was decided to make no changes in the record prior to its field trial. One question raised was of the value of the clicks introducing page numbers and another of the handling of footnotes. Another suggestion deserving consideration was that pages and/or chapters included should be noted at the start of each side. Although this information is presented in the written key accompanying the record, it would be useful for the nonreader. The major criticism of the record regarded the placement of page numbers on the index track. These should have been positioned so that those heard on the content track would follow immediately rather than start simultaneously with those on the index track. The problem occurring was that, because of the rapid rate of the index track, when a page number was heard on the index trackand the player switched back to the content track, the point of play had gone beyond the start of the page. Consequently, a user had to back to locate the start of the page. A decision was made to correct this on all future recordings. Another suggestion for future consideration was to segment the content into smaller units by dividing it into more parts on a record. However, it should be noted that the more bands there are on a side, the less space there is for recorded material.

An observation made during the critiques was that, if a record was warped, the photoelectric scanning device would not operate consistently.

Key. Information from the task analysis (Morris & Nolan, 1970b) indicated that page numbers usually served as the basis for search. Consequently, it was apparent that a means be found for locating specific

pages rapidly With this goal in mind the Aural Study System was designed incorporating the two indexing features previously described, namely, division of the content into fairly small discrete segments and facility for rapid scanning Obviously, if a user was to be able to make efficient use of the built in capabilities of the system, a key was needed to relate record sides, parts, and pages

Such a key was provided in braille This key listed the parts found on each side of the experimental recording and the pages found within each part In cases where study questions were moved to come before presentation of the part of the text containing information to answer them, this was shown on the key (e g , Part One pages 374-375, 388-389*, 376-380) A footnote on the key indicated that pages marked with an asterisk contained study questions which preceded the section to which they pertained. With this information, a user seeking a particular page could locate the page on the key and immediately learn the part in which it would be found and the side of the record on which the part would be located By also noting the range of pages found within the part, the user could estimate how far into the part the sought page might occur

Written Supplement

From information obtained in the student interviews (Morris & Nolan, 1970a; Nolan, 1966) and the task analysis (Morris & Nolan, 1970b), it was apparent that certain parts of textbooks are more useful in written form than in aural form To meet these needs a braille supplement was included as a component of the Aural Study System

Features included in this supplement were:

A title page

A table of contents for material contained in the supplement

Headings in ink-print text

Spelling lists

Names of Latin-American countries

Names of persons cited in unit

Vocabulary of unit

Study questions

Graphics

Maps

Graphs

A chart

A table

Unit activities

References

Notes for unit seven (references to quotations found in unit)

Selected reading

Further reading

Index

The written supplement accompanying the Aural Study System was a book containing a title page, a table of contents, and 34 sections. Each section was numbered and referred to on the record by its number (e.g., see supplement number 7-9). The seven represented the unit, Latin America being the seventh unit of the text (Stavrianos et al., 1962), and the nine represented the ordinal position of the section within the book of supplements. In length, individual supplements ranged from 1 to 13 pages. At the top of the first page of each supplement was the supplement number (e.g., Supplement 7-12), the ink-print page (e.g., page 387), and the name of the section (e.g., Map Showing Latin America about 1790). This same information appeared in the table of contents.

Included in the 34 sections of the written supplement were an outline of headings, three spelling lists, nine maps, seven graphs, a chart, one table, seven sets of study questions (two sets accompanying each of the first three parts of the unit and one set accompanying the fourth part), one set of unit activities, three sections of references, and an index. The sections of study questions and references were segmented as in the ink-print text. Maps were thermoformed copies of custom-made molds whereas all other pages were pressed braille. The books themselves were covered with a heavy jute-paper and bound with plastic rings. Fifteen copies were made.

Supplement 7-1 was an outline of headings found in the unit. It was included in order to provide a frame of reference for the user. Ink-print page numbers were related to each heading to provide the user with information needed for easy access. Supplements 7-2, 7-3, and 7-4 were spelling lists for names of Latin-American countries, names of persons cited in the

unit, and the vocabulary of the unit, respectively. Three lists, rather than one were used to provide for greater ease in use. The arrangement of subsequent supplements followed their placement in the text with the exception of the supplements containing study questions. These were shifted in position to precede all other supplements coming from the part of the unit to which they pertained.

Suggestions made during critiques for future consideration were: (a) to indicate ink-print page numbers where they occur as shown in the textbook format guide, (b) to note clearly the number of pages included in supplements extending over more than one page (e.g., 1 of 3, 2 of 3, and 3 of 3), (c) to include a section containing reference type footnotes rather than having these read, (d) to add supplement page numbers to the table of contents information, and (e) to have the written supplement segmented into a number of volumes as in different volumes for each unit. This latter would be highly contingent on the type of textbook involved.

Use of the Aural Study System

In using the Aural Study System's record player, a user had two options. He could use either the speaker or the headphone and he could use either the hand or foot controls. Whether he chose to use the speaker or the headphone usually would be determined by his personal preference and the circumstances under which he was studying. Similarly, whether he chose to use the hand controls or foot control would be determined primarily by his personal preference; however, when taking notes use of the foot control had an apparent advantage over use of the hand controls in that its use would enable the user's hands to be free.

Efficient use of the Aural Study System might involve integrated and coordinated use of all components of the system. A user needing to find a specific bit of information would first check the index in the written supplement to locate the page(s) on which the desired topic was discussed, then refer to the key to learn the part and side of the record on which the page would be found. With this information he could place the record on the turntable with the right side up. Using the photoelectric cell the desired part could be located quickly and, from information provided in the key, the distance within the part where the page might occur estimated. The next step would be to scan forward rapidly using the fast forward mode to determine the page. Upon learning this the user would know if the desired page had been located, if it had been passed by, or if it was further ahead. Using the fast forward or the fast reverse mode, the user could make any necessary corrections. Although page numbers were not intelligible in the fast reverse mode, this presented no problem as a user, knowing he needed to back two pages, would stop at the second garbled sound he heard. Verification of a page number only required briefly engaging either the fast forward or the normal play mode. Once a desired page was found a user could speed up location of a specific topic through use of the variable speed mechanism.

In other instances a user might use several, but not all, parts of the system. An instance of this would be to follow up a reference made on the record to something appearing in the book. Examples of this might

be, "The table, Estimated populations of Latin America and Anglo-America, 1650-2000 (See supplement number 7-28), shows that the difference is of recent origin" and, following a quotation read in the text, "See supplement number 7-3), seventh reference."

On other occasions only one part of the Aural Study System might be needed. Such instances would occur when a user needed to refer to the written supplement to study a map, to look up the spelling of a word, to check a reference, or to find a set of study questions.

Summary

An Aural Study System was developed especially for use by visually handicapped students. This system was designed to meet specifications determined by means of interviews with visually handicapped students who were experienced users of recorded textbooks and from findings of an analysis of the tasks involved in aural study. The system consisted of an especially designed record player and accompanying record and a written supplement containing information identified as more readily usable in written form than in recorded form. An integral part to use of the system was a written key that accompanyed the record indicating where specific pages from the text could be found on the record.

The first model of the Aural Study System was critiqued by a panel of blind adults all of whom were dependent on aural materials in the pursuit of their respective professions. Using information from these critiques and from further in-house review, modifications were made to the system. The resulting model of the Aural Study System was to be further evaluated through use in the field with visually handicapped students.

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Aural Study Systems for the Visually Handicapped

Field Trial of the Aural Study System

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The research reported herein was performed pursuant to a grant with the Bureau of Education for the Handicapped, U. S. Office of Education, Department of Health, Education, and Welfare. Contractors undertaking such projects under government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official position of the Bureau of Education for the Handicapped.

Department of Health, Education, and Welfare

U. S. Office of Education
Bureau of Education for the Handicapped

The field trial of the Aural Study System consisted of two phases The purpose of the first phase was to determine if blind students could learn to operate and use the various components of the system as designed. The purpose of the second phase was to determine if students could perform common educational tasks using the system. Information from both phases not only served as an evaluation of the current system, but provided a guide for future modifications and improvements of the system and future thinking regarding aural study.

Phase One

Purpose. This phase consisted of a functional test which required subjects to learn to locate and operate all components of the system. Its purpose was to determine if subjects could perform each task required, to determine the time required to complete certain of the tasks, and to detect any problems associated with task completion. A critical final task coordinating many prior tasks, required the subjects to locate the place in the recorded text where a specific topic was discussed; however, no interpretation of the text was required.

Subjects. Students participating as subjects in the first phase of the field trial were drawn from regular classes, grades 5-12, at the Indiana School for the Blind and the Ohio State School for the Blind. Eighteen subjects were enrolled at each of the schools making a total of 36 subjects. The subjects were not equally distributed among the grades. Nine represented grades 5-8 while 27 represented grades 9-12. All were braille readers. IQ scores for the group ranged from 87-118 with average IQ being 100.4.

Subjects from the two schools were selected partly by chance and partly by expediency. The schools were requested to send rosters of their braille students in grades 5-12 noting the grade level and IQ for each. These were then cross-checked against the annual quota registration documents submitted to APH by the various schools and state departments on which the visual acuity is recorded for each legally blind student. Students listed on the roster who appeared to have useful vision, even though braille readers, were eliminated. From those remaining, all students falling outside the IQ range of 83-118 were eliminated. Students for possible use as subjects were then selected by random means from the remaining pool. As subjects to be used in the second phase of the field trial were to have been trained in the first phase and be from grades 9-12, more subjects were selected from these grades than from grades 5-8.

Materials. Materials used in the study included all components of the Aural Study System described in the previous report. In addition a verbal checklist (see Appendix A) was used to test subjects' verbal understanding of their initial instruction. Final evaluation of the subjects' ability to operate the system was made using the functional level test

(see Appendix B) This test provided a series of tasks the subjects had to perform and provided a place for recording the correctness of the responses and, in some cases, the times of the responses

Procedure. Subjects were trained and tested at the Ohio school and subsequently at the Indiana school by three experimenters. Each worked individually with six subjects for one class period on each of five days. Where subjects learned rapidly, the fifth day was eliminated.

Training and testing generally followed the schedule below:

day 1 — general orientation to the Aural Study System and presentation of the record player and the record

day 2 — presentation of the record player, the record, the key, and the written supplement

day 3 — presentation of the written supplement
presentation of the verbal checklist

day 4 — remedial training
practice doing study tasks using the total system

day 5 — test of performance

Training each day commenced from a standard setup for all materials, including all switches on the player in off or neutral, tone arm at rest, and the record placed in its envelope and set in a standard position along with the written supplement. A checklist which guided the sequence of training is found in Appendix C. Each experimenter was thoroughly familiar with the terminal behaviors desired in training as described in the training program which appears in Appendix D.

Length and sequence of training varied somewhat among subjects according to individual progress. Generally, subjects received two to three days training. Their proficiency was then checked with the verbal checklist. Remediation was given where required with extra practice filling the remainder of the fourth day. In a few cases where training appeared complete as indicated by the verbal checklist, subjects completed the functional level test on the fourth day. All other subjects were tested during their fifth session regardless of whether or not they had completed the entire training program. During the training sessions, subjects were required to keep at a task until it was accomplished successfully at least once.

Results. Not all subjects (4) completed training. However, all completed most training and all were tested on 30 of the 42 operational tasks. Data for subjects attempting each operational task were compiled in terms of accuracy of performance and, for those tasks that were timed, mean times required. Table 1 reports the data, as broken down for each task, by the number of subjects attempting the task, the percentage of those attempting the task who performed it successfully, and, for those items that were timed, the mean time required to perform the task by those who did it correctly.

TABLE 1

Performance Record for Phase One of the Field Test of the Aural Study System in Terms of the Specified Tasks, the Number of Subjects Attempting Each Task, the Percentage of Those Attempting Each Task Who Performed It Correctly, and, for This Latter Group, the Mean Time Required for Certain Tasks That Were Timed

Task	N	% Successful	Mean Time (sec.)
1. With the power off, locate the headphone jack and plug the headphones into it. (unplug)	36	100	
2. With the power off, locate the speaker jack and plug the speaker into it.	36	100	
3. Turn the power on.	36	100	
4. Set the turntable speed at:			
16-2/3 rpm	36	94	
stop	36	97	
33-1/3 rpm	36	92	
8-1/3 rpm	36	92	
5. Place the record on the turntable with side one up Time:	36	100	14.9
6. Using the record edge finder, set the stylus on the record so that it plays from the beginning.	36	89	
7. Using the volume control:			
increase the volume	36	94	
set for a moderate vol.	36	94	
turn to a low volume	36	94	
8. Using the tone control:			
set for full treble	36	94	
set for full bass	36	97	
set for a blend of the two	36	97	

TABLE 1 (continued)

	Task	N	% Successful	Mean Time (sec.)
9.	Using the variable speed control:			
	increase speed fully	36	97	
	decrease speed fully	36	100	
	set for normal speed	36	81	
10.	Using the ff/fr switch:			
	play in ff mode	36	100	
	play in fr mode	36	100	
	shift to normal	36	100	
11.	Using the pause switch, stop briefly.	36	100	
12.	Remove the tone arm from the record.	36	100	
13.	Using the photoelectric scanning device, locate the fourth part of this side of the record and start playing at the beginning of it. Time:	34	97	22.6
14.	Using both the photoelectric scanning device and the index track of the record, locate page 403 on the record. It will be found in part six. Time:	35	100	108.0 (1.8 min.)
15.	With the power off, plug the foot control in and position it for use.	36	86	
16.	Set the stylus in the middle of the record and play at the normal rate.	36	100	
17.	Play at fast reverse.	36	100	
18.	Play at the fast forward rate. Shift back to normal when you hear the next page number	36	100	
19.	Stop. (With power off, unplug foot control.)	36	100	

TABLE 1 (continued)

	Task	N	% Successful	Mean Time (sec.)
20.	(Now let's look at the book.) In what supplement would you find a map showing the climate of Latin America?	36	97	
21.	On what page in the ink-print edition would this map be found?	36	100	
22.	In what supplement would you find Reviewing the Essentials for the section on Politics: The Paradox of Authority and Instability?	35	83	
23.	Find it. Time:	34	94	18.9
24.	Now find the same part on the record. Time:	32	66	205.0 (3.4 min.)
25.	(Turn back to the Table of Contents for the book.) What is found in Supplement 7-4?	35	100	
26.	What is the last word on this list?	34	91	
27.	Find the ink-print page and the part of the record for the text-book heading "people" following the headings "Latin America" and "basic facts."	32	50	
28.	In what supplement would you finding the spelling of Argentina?	34	94	
29.	On what pages are Mayas (M-a-y-a-s) discussed?	35	91	
30.	Read the first sentence of the first activity listed under Unit Activities.	31	77	
I.	If you were instructed to locate the place on the record where cattle raising is discussed, show me how you would go about doing it. Time:	32	94	338.3 (5.6 min.)

Prior to the experiment, a criterion of 90% successful completion of each task had been set. Of the 42 tasks or subtests, 35 or 83% were performed to this level. There were seven tasks for which the percentage of success fell below criterion. These were: 6. using the record edge finder (89%); 9. setting the variable speed control for normal (81%); 15. plug in the foot control (85%); 22. determine where "Reviewing the Essentials" for the section "Politics" would be found in the written supplement (83%); 24. find this same part on the record (66%); 27. find the ink-print page and record part for a textbook heading (50%); and 30. read first sentence of the first activity listed under "Unit Activities" (77%). While these data imply some problems with the system, the importance of these is not great as is indicated by data on the final task. These show that of 32 subjects attempting the final task, which required coordinated application of most of the prior tasks, 94% were successful.

Tables 2 and 3 report data on accuracy of performance and rate of performance, respectively, as broken down into the four grade groupings; 5-6, 7-8, 9-10, and 11-12. Table 2 describes the consistently high accuracy of performance among all grade groupings. The data in Table 3 suggest that some differences in time required may exist between grade groups. To test for this, Kruskal-Wallis one-way analyses of variance were run for each of the six timed tasks. Because of the small number of subjects in the lower two grade groupings, data from grades 5-8 were combined for these analyses. The only statistically significant difference occurred for task number 14 where grades 9-10 took significantly less time than did the other two groups.

TABLE 2

Number of Subjects and Percentage of Tasks Done Correctly
By Subjects at Four Grade Level Groupings

Grade Level	N	% of Tasks Correctly Done
5-6	6	93
7-8	3	95
9-10	13	95
11-12	14	94
Total	36	94

TABLE 3

Average Time in Seconds Required by Subjects at Four Paired Grade Levels for Tasks Done Correctly

Grade Level	No. 5	No. 13	No. 14	No. 23	No. 24	Educational Level Task
5-6	17.5	26.0	129.7	31.4	259.8	416.8
7-8	15.3	18.7	108.3	10.3	230.0	305.5
9-10	14.4	19.3	86.5	19.9	200.4	349.2
11-12	14.1	25.2	120.4	14.3	182.1	297.0

At the Indiana school a record was kept of the time required to perform the various steps comprising the final task on the functional level test. In order to accomplish this task, subjects were required to use all components of the Aural Study System in an integrated manner. From fastest to slowest these were: using the record label, placing the record on the turntable and finding the desired part, using the index of the written supplement to learn the pages needed, using the key to ascertain the part of the record where the sought pages would be found, finding the page on the record after the part is located, and finding the sought topic once the page has been located. Obviously, this last is intricately related to how far into the page a user must search in order to locate the topic. It might be noted that four subjects from the total group completed the entire educational level task in less than 3 minutes, the shortest time required being 2 minutes, 20 seconds.

An auxiliary observation made in connection with task 5 was that 66% of the subjects used the record guides when placing the record on the turntable. Those who used the record guides took, on the average, 3.6 seconds less time to place the record than did those who did not.

In evaluating the reported data, certain qualifications should be kept in mind. These have to do with the fact that the subjects did not all work under identical conditions. The major difference involved time. All subjects did not have the same amount of time for training/practice or for the test. One reason for this was that the length of the class periods at the two schools varied; Ohio having 35 minute periods while Indiana had 50 minute periods. In addition to this, a few subjects were terminated after their fourth session rather than having five as did most. Another irregularity concerning time was that no consistent cutoff time was used for test tasks. Still another irregularity was that, due to both limited time and, in a few instances, mechanical problems with the equipment, not all subjects had an opportunity to attempt all test tasks. Most did. Other variables included experimenter variables such as where emphasis was placed during training and the amount of cuing given during the test. Still another matter for consideration was that a few of the slower subjects did not cover the entire training/practice program, while the amount of practice, in terms of practice

tasks, for other subjects was positively related to the speed with which they worked.

For these reasons plus the fact that the tasks on the test were not of equal difficulty, the data should be considered only in general terms. Both the percentage of correct responses and the mean times reported reflect only those items that were attempted for which ample time was allowed.

All subjects learned to use the Aural Study System without undue difficulty. Several problems, however, did become apparent during the first phase of the field trial. One of these was of amplifier failure in the record player. This proved to be a problem in the electrical circuitry and was corrected on all players. Another problem with the record player was that the tone arm needed to be more rigidly constructed as the photoelectric cell, which was mounted in the tone arm, only operates within a narrow critical range of vertical distance from the record. If the tone arm's vertical position varied even slightly or the record was warped, the photoelectric cell would not operate properly. Two other obvious problems with the record player were that it was difficult to plug the foot control into the player and that persons using the foot control often "forgot" and simultaneously used the hand controls. Consequently, the electrical circuitry needs to be such that either can be used individually or both compatibly.

The only major problem in use of the Aural Study System was a recorded book format problem caused by moving the study questions to precede the material to which they pertained. This caused problems with use of the record as well as in use of the key, since not all pages were ordered sequentially.

The only difficulty encountered in use of the written supplement was with Supplement 7-1 which was entitled "Unit Seven--Headings in Ink-print Text." This section was set up as an outline which, due to braille format, was difficult for the subjects to use. Also, it was apparent that many subjects were not familiar with textbook headings per se.

Discussion. Phase one of the field trial was believed to be successful. It clearly demonstrated that the Aural Study System could provide a means of communication for the blind which can be learned and used with ease. In this phase of the field trial, problems with the system were identified through observation and subject performance. A brief commentary follows for those tasks on which greater than 10% of the subject erred on the test.

The test task for which the greatest number of subjects had difficulty (50%) was item 27 which required use of the individual supplement of headings. Factors causing this have already been discussed and it is recommended that no such listing be included in subsequent editions of written supplements. The item on the test causing the second greatest difficulty (34%) was number 24. This item required locating a specific set of study questions on the record. The problem here was that the subjects were confused by the pages containing the study questions being out of their normal sequence. It is recommended that in subsequent versions of such materials the study questions be left in their regular sequence. Item 30 on the test presented the third greatest difficulty (23%). It required location and use of the section on unit activities found in Supplement 7-30 which was located near the end of

the written supplement. The problem here was probably twofold. First, subjects in grades 5 and 6, who accounted for nearly half of the total error on this task, were not familiar with this section of textbooks and, second, this feature was not covered thoroughly enough in the training/practice program. No changes are recommended concerning this feature. The errors made on the third part of item 9, which represent the fourth greatest test task difficulty (19%) appeared primarily a matter of communication. This task required the user to change the play rate back to normal after use of the variable speed machanism. Properly done, this required the pushing in of the variable speed control knob. All subjects who missed this question tried returning the speed to normal by adjusting the variable speed control. No changes in the device are suggested. The fifth most frequently missed item (17%) was number 22. This task required use of the table of contents in the written supplement to determine the number of the supplement within it where a specific set of study questions would be found. Whether the problem was due to the use of the table of contents or the placement of the study questions is not readily apparent. No changes other than returning the study questions to their proper ordinal position are recommended. The test item causing the sixth greatest difficulty (14%) was item 15 which required subjects to plug the foot control into the player. Redesign of the plug to reduce the force required for insertion would remedy this problem. The seventh most frequently missed (11%) test item was number 6. This task required use of the record edge finder to locate the outside edge of the record. It is recommended that the record edge finder by eliminated from subsequent models of the player as the photoelectric cell provides a more efficient means for locating the edge of the record.

An observation made during this phase of the field test was that a student using the Aural Study System needs to have a sizable work space. Obviously, this need for space will be even greater when other study tools and materials are in use.

Phase Two

Purpose. This phase of the field trial explored whether braille students could use the Aural Study System to accomplish common study tasks, explored the quality of their completion of common study tasks, and compared speed of task performance through use of the hand and foot controls of the player.

Subjects. Students who participated in the second phase of the field trial were restricted to those in grades 9-12 who had been trained to use the Aural Study System in the first phase. As the material to be used was written for grades 10-12, it was felt that students from the lower grades would be at a disadvantage and, therefore, should not be included. Of the 27 students who were eligible, 24 were selected for subjects, 12 being from each of the Ohio and Indiana schools. Four of these were from grade 9, eight from grade 10, nine from grade 11, and three from grade 12. Subsequently, one subject from grade 9 was dropped because of attitude and one from grade 10 was dropped because of being primarily a large print reader. The average IQ of the 22 subjects used was 102.8; the IQ range was 91-115. After being told what would be required of them, all subjects included replied in the affirmative when asked if they would be willing to

participate in the second phase of the field trial.

Materials. All components of the Aural Study System were used with the same starting setup used in the first phase of the field trial. This setup specified the position for all of the player's controls as well as the exact placement for all components of the system.

Four different study tasks were selected as being representative of typical study activities. These were the answering of study questions with short, factual responses; the verbatim copying of quotations; the outlining of a section of the text; and the summarizing of a section of the text. Criteria used in selecting the study questions were: (a) that the key word be listed in the braille index, (b) that only one page reference be given in the index for the key word, (c) that the page where the answer was located be in a part of the record where the pages were in proper numerical order so that there would be no confusion caused by the study questions being out of sequence, (d) that less than 2 minutes of listening time, at normal rate, be required between the page number announcement and the information required to answer the question, and (e) that answers to all questions be clearly stated in the text in order to diminish any effects of intellectual interpretation. Eleven study questions were selected; six for practice and four plus an alternative for the test. Criteria used in selecting the two quotations to be copied were: (a) that the page where the quotation was located be in a part of the record where the pages were in their proper numerical order so that there would be no confusion caused by the pages containing study questions being out of order, (b) that less than 2 minutes of listening time, at normal rate, be required between the page announcement and the beginning of the sought quotation, (c) that the two quotations be of approximately the same length, and (d) that the quotations contain a minimum of 35 words. One of the quotations chosen started at 88 seconds (normal rate) into a page and contained 46 words. The other started at 59 seconds (normal rate) into a page and contained 45 words. All study tasks are listed in Appendix E.

Listening time for the outlining task, at the normal rate, was 6 minutes 56 seconds. For the summarizing task, at the normal rate, listening time was 3 minutes even.

Subject data sheets for each subject were used to record time required to locate information and time required to complete tasks, to provide a place to record comments and observations made by the examiner concerning performance of the tasks, and to provide information for the examiner as to whether he should have the subject use the hand controls or the foot control for each of the tasks. Also provided was a place to record the subject's response as to his preference for use of hand or foot controls for tasks done on each of the three test days. A copy of the data sheet can be found in Appendix F.

Procedure. The second phase of the field trial was conducted during the same semester as the first. At the Indiana school it was run 7 weeks after the first while at the Ohio school it was run 15 weeks later.

Two of the three examiners who had participated in the first phase conducted the second phase of the field trial. Both simultaneously worked during a four day period at each of the two schools. Subjects were seen individually during one class period for each of four consecutive days. Each examiner was scheduled to work with six subjects at each school.

At the start of each week, each examiner introduced or reintroduced himself to each subject, related the current experiment to the previous one, queried the student on his willingness to participate, and briefly reviewed the Aural Study System. During the week the following schedule was followed with only minor alterations.

day 1——review and practice study questions

day 2——test--answering four study questions

day 3——test--copying two quotations

day 4——test--one outlining task and one summarizing task

In order to compare speed of performance using the hand controls with speed of performance using the foot control it was necessary that each task be performed under both conditions. Therefore, six orders of hand controls/foot control conditions were permutated for the first series of test tasks; the four study questions. These orders were assigned, using a table of random numbers, to the subjects in a manner insuring that each of the six subjects with whom each of the examiners worked at each of the schools would have a different hand controls/foot control order on his first series of test tasks. The orders were predetermined and randomly assigned to the ordinal position of the subjects as they were seen during their first session. For example, at the Indiana school, experimenter A was to assign the first subject he saw on his first day to hand controls/foot control order 3 (hand, hand, foot, foot), his second subject that day to order 4 (foot, foot, hand, hand), etc. This order also determined the order for all subsequent test tasks as they were systematically alternated between the two conditions following the fourth study task. Thus, if test study questions 4 was performed using the foot control, the next task (copying the first quotation) would have to be performed using the hand controls, the next task (copying the second quotation) using the foot control, etc. During the first session, which was for review and practice, all subjects used the hand controls to perform the first task, the foot control for the second, etc. alternating regularly.

Subjects were required to write their responses. A braillewriter and paper were provided for this purpose. On the first day each subject decided where he wanted the braillewriter placed and this was the position in which it was initially placed during all his subsequent sessions.

While a subject worked, the experimenter noted the time required for him to locate the required place on the record and the time required for him to complete each task. A stopwatch was utilized for this purpose.

Space was provided on the subject data sheet for the experimenter to note any comments for each specific task as well as to note any comments for a category of tasks. For the latter two tasks, outlining and summarizing, a record was kept of how the time was spent by keeping track of the sequence and amount of time spent listening (on record) and writing, etc. (off record).

The experimenters spelled key words as the tasks were presented to the subjects. Special instructions for the study question tasks were to give no assistance other than with the index; and to note if such help was required. Subjects were to be given a maximum of 10 minutes for each task. For the two copying tasks special instructions were to give assistance in locating the quotations, if necessary, but to keep a record of any such help. The time limit for each of these two tasks was 14 minutes. For the outlining and summarizing tasks special instructions were that help could be given in locating the proper places in the recorded text, but that if such help was given it should be so noted. No time limits were stipulated for these two tasks. The rationale for granting assistance in locating topics was that the primary purpose of the second phase of the field trial was to see if students could perform study tasks using the Aural Study System of which locating topics was only a part.

Definitions were provided for outlining and summarizing to be given only if a subject asked for the meaning. For the former this was, "An outline is a brief list of words or phrases that would help you remember the main thought of the section." The definition given for summarizing was, "In a few words of your own write out the main ideas of the section."

The specified starting setup was used for the first two sessions of the second phase of the field trial. However, it was not used for the third and fourth sessions as the tasks to be performed did not require use of either the written supplement or the key. Rather, these were removed and the starting arrangement used was that the record player was set up for use (power off) with the record on the turntable, side one up.

Results. The purpose of this phase was to examine the extent the Aural Study System could be used to perform four study tasks. The data consisted of students written answers to the study tasks, times for completion of certain tasks, and comparative times for use of hand and foot controls. While students' responses to the study tasks could be objectively quantified, the assignment of qualitative meaning to these data could only be subjective. It is believed the frame of reference used generally reflected that commonly used by classroom teachers for this purpose. It involved categorizing the quality of response into one of the five following qualitative groupings: excellent, good, adequate, poor, and very poor. These categories could be compared to the common letter grades.

Data for the study question tasks are reported in Table 4. Perfect solution to these required the student to identify a total of seven simple facts. Of the 22 subjects, only 2 responded in ways that were awarded the qualitative judgment of very poor.

TABLE 4

Ranking of Responses for Study Questions

Qualitative Category	Number of Facts Noted	N
Excellent	7	1
Good	6	5
Adequate	5	5
Poor	3-4	9
Very Poor	1-2	2

The copying tasks were ranked in terms of actual errors. These included omissions, substitutions, and inversions of words. Spelling, punctuation, and braille code errors were not counted. Number of errors ranged from 1-28 with a median of 8. Four subjects fell in the very poor category. These data appear in Table 5.

TABLE 5

Ranking of Responses for Copying Tasks

Qualitative Category	Number of Errors	N
Excellent	0-4	4
Good	5-6	5
Adequate	7-10	4
Poor	11-15	5
Very Poor	16-28	4

The outlining task was categorized in terms of the major topics (there were five) that the student noted in his outline. Table 6 reports these data. Major topics reported range from 0-5 with a median of 3. Two subjects' performance fell in the very poor category.

TABLE 6

Ranking of Responses for Outlining Task

Qualitative Category	Number of Major Topics Noted	N
Excellent	5	5
Good	4	5
Adequate	3	5
Poor	2	5
Very Poor	0-1	2

Data for the summarizing task are reported in Table 7. The summarizing task was categorized in terms of the quality of the definition of the main theme and by the number of main ideas included in the summary. The 22 summaries were first individually ranked on a 22 point scale and then categorized into the five qualitative groups. Responses of four subjects were categorized as very poor.

TABLE 7

Ranking of Responses for Summarizing Task

Qualitative Category	N
Excellent	4
Good	5
Adequate	4
Poor	5
Very Poor	4

Qualitative scoring was completed independently by two experimenters. Correlations between category assignments were as follows: study question tasks .89, copying tasks .92, outline task .90, and summary task .55. The very great subjectivity of scoring this latter task is reflected by this low level of agreement.

Two time measures were kept for each task. One was of the time required to locate a sought place on the record, and the other was of the time required to complete the task. The average times required to locate and complete each of the four types of study tasks were: 4.7 minutes for a study question, 9.5 minutes for a copying task, 18.0 minutes for the outlining task, and 9.8 minutes for the summarizing task. These times,

naturally, include the time required to listen to the pertinent material. Fifteen of the 176 individual tasks were not completed primarily because of time limitations. In no way are these 15 reflected in the average times reported. Of the 176, 175 were located successfully. For this composite, the average time required to locate a sought place was 3.2 minutes.

A series of t tests was run to test the difference in time required to perform tasks using the hand controls with time required to perform them using the foot control. These results are reported in Table 8 along with the average time required and the standard deviations for each type of task under both of the conditions. The only task for which the difference in time was significant (.01) was for the outlining task for which the foot control was the more efficient.

TABLE 8

Time Data as Reported in Minutes for Tasks Performed Using Hand Controls and Foot Control
Averages, Standard Deviations, Degrees of Freedom, and t test Results

Task	hand $\bar{x}$	hand σ	foot $\bar{x}$	foot σ	df	t
Time to locate	3.05	1.44	3.40	1.23	173	1.75
Time to answer study questions	1.44	1.39	1.56	1.40	80	.38
Time to copy	5.73	2.53	6.47	2.39	42	1.00
Time to outline	18.64	3.91	12.68	3.06	14	3.31*
Time to summarize	6.57	1.59	6.77	1.87	17	.24

*$p < .01$

Subjects preferred use of the hand controls. In response to queries, 82% favored their use when answering study questions, 57% preferred them for copying tasks, and 65% favored their use when doing other types of study tasks.

Discussion. The outcome of phase two must be viewed in light of the subjects' almost total lack of previous experience in use of recorded textbooks, their limited training in use of the system, and the time interval between that training and the performance of the tasks required in phase two.

All subjects were able to perform each of the four tasks to some extent; however, only the performance of from 11 to 15 of the 22 subjects participating fell at the adequate level or above. Under the circumstances the researchers view these results as encouraging further research and development of the system.

A number of general observations were made of problems subjects encountered in use of the Aural Study System. As implied above many subjects were not familiar enough with the equipment to be spontaneous or proficient in using it. For instance, they were not knowledgeable of shortcuts or of judging distances. Some would lose their place by engaging the wrong control or by inadvertently knocking the tone arm off place. Another problem observed in use of the equipment that was also noted in the first phase of the field trial was that subjects frequently "forgot" they were using the foot control and would grab for the hand controls. The foot control was the source of a number of difficulties which possibly accounted for subjects' preference for the hand controls and the fact that, contrary to expectancy, no significant difference in time was found between use of the hand controls and use of the foot control when performing the copying tasks. Logically, it would appear that the foot control would have provided for greater efficiency. One problem with the foot control, as noted in the initial critique, was that the foot control's stops were not positive enough to provide definite position designation. Additionally, there were actually two stops for the play mode; one fairly positive and the other faint. A feature not liked by some users was that in some positions the user had to hold his foot on the foot control in order to keep the player operating in the desired mode. Many users commented to the effect that the foot control did not provide for good enough control. A factor inteferring with use of the foot control was that subjects often placed their braille-writers on their laps when making notes; a practice not altogether compatible with leg movement associated with use of the foot control. This problem could be alleviated through redesign of the foot control to make it smaller thus enabling operation by foot action, which could be controlled by the ankle, rather than knee movement which involves the whole leg as is necessitated by the current design.

Another problem that occurred in connection with use of the system was that many subjects, although at a high school level, did not know the alphabet well enough to enable them to use the index proficiently and consequently had difficulties in locating the desired place on the record. This problem reflects more on the subjects than on the design of the system. The former is probably an outgrowth of the fact that blind people do not encounter alphabetical listings as commonly in everyday life as do sighted people (e.g., using the telephone book).

Work space is a very real problem as previously noted. Because of the amount of equipment and materials needed to study from recordings, regardless of the type, a sizable area is needed where a student can organize his "tools." Production design of the player would result in greatly reducing the size of this component.

Two observations of the subjects themselves were that (a) generally speaking, they did not check their work and (b) their spelling was abominable. Although proper nouns and uncommon words or words specific to the topic were spelled in the recording, it was noted that most subjects were unable to spell even common words.

Problems specific to the task of answering study questions were recognizing key words to look up in the index, forgetting the page number being sought or the question to be answered, and either not comprehending the question or not paying enough attention to note the answer when heard. Some time was wasted in relocating the start of a passage in order to relisten.

Problems specific to the copying tasks were listening to segments too long to remember, not recognizing the end of a quotation when heard even though this was noted in the recording by the insertion of the comment "end of quote," and judging backing distances. Low skill in use of the equipment created certain additional problems such as losing one's place by accidently engaging the wrong mode of operation (e.g., fast forward instead of fast reverse) and by not stopping the player while writing and, consequently, wasting time by having to refind the next starting place. The basic technique used for copying was to listen to a few words, etc. A good procedure used by some was to listen to the entire quotation first before attempting to copy it.

The main problem encountered in the outlining task was that subjects were not experienced in outlining and tended to include too much detail. Recognizing the end of the section to be outlined also presented some difficulties. Most subjects outlined as they went along by listening to short sections and then stopping and making notes then continuing by listening to another short section. This piecemeal procedure did not provide for an overview of the subject matter and probably accounts for the amount of detail subjects included in their outlines.

No particular problems were encountered in the summarizing task other than that many subjects included too much detail in their summaries. A technique used in summarizing was to listen to the whole section and then summarize it. Some subjects varied this by listening to parts of the summary, stopping, and summarizing as they went along.

Performing study tasks using recorded material was a unique experience for most of the subjects participating in this field trial. Considering this, the fact that all subjects included in this phase of the field trial could perform such tasks is extremely positive. Undoubtedly, their skills would improve with experience both with studying from aural materials and with use of the Aural Study System.

Conclusions. Both phases of the field trial bore positive results. These were, respectively, that students from elementary school through high school were able to learn to operate and use the various components of the system without great difficulty and that high school level students could use the system to perform study tasks. The system was found to work

quite well. A presumption concerning its use is that with more practice, efficiency of use would improve.

Modifications recommended for the current system are that the player's foot control be redesigned to have more positive stops, to be easier to plug in, and to be smaller; that the electrical circuitry of the player be changed so that use of the foot control be compatible with use of the hand controls in order that the latter could be used when the foot control is engaged without damaging the player, that the tone arm be made sturdier so that the photoelectric cell would work more reliably; and that the record edge finder be eliminated. It is strongly recommended that future recordings provide all information in proper sequence. As for supplementary written material, it is suggested that the list of headings be omitted and that all sections be in their proper ordinal positions.

Students who use aural materials for study purposes need to be instructed in their use. Additionally, they need to be thoroughly versed in the capabilities of the equipment they are using. Instructional materials are needed for both of these purposes. It is suggested that materials be developed for teaching students how to study from recorded materials and that, for any recording equipment made to be used for study purposes, materials such as the training program used in this field trial be formalized and recorded as a self-instructional program in order that the equipment be of maximum usefulness to the users.

APPENDIXES

APPENDIX A

VERBAL CHECKLIST

Aural Study Systems for the Visually Handicapped

Equipment and Materials Evaluation

VERBAL CHECKLIST

Name _____ Sex _____ Grade _____

School _____ Date _____

Player

1. The player on the table before you is plugged into an electrical outlet. What steps are required to make it operational?

   plug in speaker or headphones

   turn on the power

   set the turntable speed for the desired rate

2. What are the five features of the player located on the top deck?

   turntable

   turntable speed control

   record guides (stops)

   speaker jack

   tone arm

3. What are the three speeds at which the player can be set to play?

   8-1/3 rpm

   16-2/3 rpm

   33-1/3 rpm

4. How do you engage the record edge finder?

   depress button on top of tone arm

5. What two things happen when you depress the lever at the top of the tone arm?

   the stylus is retracted

   the photoelectric scanning device is activated

6. For what are the record guides (stops) used?

   positioning record to be put on turntable

7. What six features are found on the front panel of the player?

   volume control--also, off/on

   tone control

   variable speed control

   fast forward/fast reverse

   pause switch

   headphone jack

8. What two things happen when you engage the fast forward or fast reverse modes?

   index track is engaged

   record plays fast

9. For what purposes would you use the fast forward and/or fast reverse modes?

   scanning

   place finding

10. At what rate does the turntable turn when in the fast forward or the fast reverse mode?

    66-2/3 rpm

11. For what purpose would you use the pause switch?

    to take notes

12. Using the variable speed control, what is the speed range at which you could play a record when the turntable speed is set for 16-2/3 rpm?

    half way up to the next faster setting (25 rpm) to all the way down to the next slower setting (8-1/3 rpm)

Foot Control

13. What are the four operations that can be controlled by use of the foot control?

    fast forward

    play

    stop

    fast reverse

14. When would you be most likely to use the foot control?

    for note-taking

Record

15. What information is given on the record labels?

    sides

    parts

16. What separates the parts on the record?

    blank bands

17. How can you locate a particular part?

    using label information, locate side containing part and range of parts on the side

    use photoelectric scanning device

18. How would you find a page after locating the part it is in?

    scan using fast forward and fast reverse (index track)

19. Where would you find the study questions for a particular section the unit on the record?

    at the start of the section

20. What does it mean when the record says, "The whole of page 390 is devoted to a political map of Latin America. See Supplement number 7-15."

    a political map of Latin America is found on page 390 of the ink-print edition of the text

    a political map of Latin America will be found in Supplement number 7-15 of the braille book

Book

21. In the book, Supplement number 7-1 lists the headings found in the ink-print text. What are the other two bits of information given in this supplement?

ink-print page number where heading is found

record part where heading is found

22. Three spelling lists are given. What are they?

names of Latin-American countries

names of persons cited in unit

vocabulary of unit

23. How are these spelling lists organized?

alphabetically

24. Where are the study questions for each of the four sections of the unit found in the book?

preceding the other supplements pertaining to the section

25. If you were to make a report on Latin America, what information in the book would help you find additional information?

Selected Reading--Supplement number 7-32
Further Reading--Supplement number 7-33
> references

26. What information is given in the supplement entitled "Notes for Unit Seven"?

references for quotations found in the unit

27. How is the index organized?

alphabetically

28. For what purpose might you use the index?

to find the pages where specific items are discussed

APPENDIX B

FUNCTIONAL LEVEL TEST

AND

EDUCATIONAL LEVEL TEST

ASS--Equipment and Materials Evaluation--1971

FUNCTIONAL LEVEL TEST

Name _____ Sex _____ Grade _____

School _____ Date _____

Feature	Performance Locate and Operate	Comments
1. With the power off, locate the headphone jack and plug the headphones into it (unplug)		
2. With the power off, locate the speaker jack and plug the speaker into it		
3. Turn the power on		
4. Set the turntable speed at: 16-2/3 rpm stop 33-1/3 rpm 8-1/3 rpm		
5. Place the record on the turntable with side one up Time:		Note if record guides are used
6. Using the record edge finder, set the stylus on the record so that it plays from the beginning.		

Feature	Performance Locate and Operate	Comments
7. Using the volume control: increase the vol. Set for a moderate volume turn to a low vol.		
8. Using the tone control: set for full treble set for full bass set for a blend of the two		
9 Using the variable speed control: increase speed fully decrease speed fully set for normal speed		
10. Using the ff/fr switch: play in ff mode play in fr mode shift to normal.		
11. Using the pause switch, stop briefly.		
12. Remove the tone arm from the record.		Note if stylus is retracted.

Feature	Performance Locate and Operate	Comments
13. Using the photo-electric scanning device, locate the fourth part of this side of the record and start playing at the beginning of it. Time:	P. 389 Politics: The paradox of authority and instability	
14. Using both the photoelectric scanning device and the index track of the record, locate page 403 on the record. It will be found in part six. Time:	P. 403 Finally the church lost much of . . .	
15. With the power off, plug the foot control in and position it for use.		
16. Set the stylus in the middle of the record and play at the normal rate.		
17. Play at fast reverse.		

	Feature	Performance Locate and Operate	Comments
18.	Play at the fast forward rate. Shift back to normal when you hear the next page number.		
19.	Stop. (with power off, unplug foot control)		
20.	(Now let's look at the book.) In what supplement would you find a map showing the climate of Latin America?	[7-9 (Table of Contents)]	
21.	On what page in the ink-print edition would this map be found?	[P. 379 (Table of Contents)]	
22.	In what supplement would you find Reviewing the Essentials for the section on Politics: The Paradox of Authority and Instability?	[7-13 (Table of Contents)]	

Feature	Performance Locate and Operate	Comments
23. Find it. Time:		
24. Now find the same part on the record. Time:	[Pp. 406-407(Table of Contents) and at the end of part three (loose sheet)]	
25. (Turn back to the Table of Contents for the book) What is found in Supplement 7-4?	[Spelling List for Vocabulary of Unit (Table of Contents)]	
26. What is the last word on this list?	[Yucatan (spelling list)]	
27. Find the ink-print page and the part of the record for the textbook heading "people" following the headings "Latin America" and "basic facts."	[P. 380, pt. 2 (headings)]	
28. In what supplement would you find the spelling of Argentina?	[7-2 (Sp. List for Names of Latin American Countries)]	

Feature	Performance Locate and Operate	Comments
29. On what pages are Mayas (M-a-y-a-s) discussed?	[Pp. 384,385, and 418 (Index)]	
30. Read the first sentence of the first activity listed under Unit Activities.	["On an outline map of Latin America show the natural and human resources of the region." (7-30 located from the Table of Contents)]	

I. If you were instructed to locate the place on the record where cattle raising is discussed, show me how you would go about doing it.

Performance	Comments	Time (Cumulative)
check index for cattle raising [P. 408]		
using the loose sheet with the record or Supplement number 7-1 (Headings in Ink Print Text), find the part in which the page will occur [part 8]		
from the record label, find the side containing the desired part [side 2]		
it will also be necessary to note the range of parts contained on that side [7 through 11]		
locate part using photoelectric scanning device		
find page using fast forward (index track)		
listen to page until cattle raising is discussed		

Total time:

General Comments:

APPENDIX C

CHECKLIST--SEQUENCE OF TRAINING

Aural Study Systems for the Visually Handicapped

Equipment and Materials Evaluation

CHECKLIST

Front Panel

volume control--also, off/on

tone control

variable speed control--using the variable speed control, the turntable speed can be increased half way to the next faster setting or decreased all of the way to the next slower setting (e.g., if set at 16-2/3 rpm, range of speeds possible through manipulation of the variable speed control would be 8-1/3 to 25 rpm)

fast forward/fast reverse--66-2/3 rpm; index track

stop switch--used for pauses

headphone jack

Top Deck

turntable

turntable speed control--moving clockwise, 8-1/3, stop, 16-2/3, and 33-1/3 rpm

record guides (stops)

speaker jack

tone arm--horizontal movement only

button to activate record edge finder

record edge finder

lip extending over end

lever on top

retracts stylus making horizontal movement possible

activates photoelectric scanning device

unit activities

references

notes for unit seven--references for quotations found in unit

selected reading

further reading

index

APPENDIX D

TRAINING PROGRAM

Aural Study Systems for the Visually Handicapped

Training Program

Name _____ Grade _____ Shoe Size _____ Yrs. Br. ____

Desired terminal behaviors have been underlined and have been designed to familiarize the user with different aspects of the Aural Study System.

I. Familiarization to the record player.
The The student should be able to . . . ."

A. List verbally five features of the record player that are located on the top deck.

1. Examine the top deck, and name the features or controls with which you are already familiar.

2. Discuss location of the turntable, turntable speed control, speaker jack, tone arm, and record guides. (See orientation to position of controls if student experiences any difficulty.)

3. Discuss the shape of each feature and its position relative to sides of the top deck.

4. Name the five features discussed in A-2.

B. List verbally five controls that are located on the front panel.

1. Discuss the location of the volume control, tone control, variable speed control, fast forward-fast reverse control, and the pause control. (See orientation to position of controls if student experiences any difficulty.)

2. Discuss the shape of each control and its position relative to other controls and reference points of the panel.

3. Discuss the location of the headphone jack.

4. Name the five controls discussed in B-1 and the other feature of the front panel noted in B-3.

C. Describe each control with respect to its shape and its operation.

1. What is the shape of the volume, tone, and variable speed controls?

2. What is the shape of the fast forward-fast reverse and pause controls?

3. Activate each control especially noting the movements required for round controls and the toggle type controls.

4. Demonstrate the range possible using the variable speed control, and that the normal speed is obtained by merely pushing it in.

5. Especially note the power to the machine is activated through the volume control

6. Describe stops for the turntable speed control in terms of clockface positions and practice manipulations.

7. Touch any feature or control of the record player upon command.

D. List verbally the four steps generally required to make the record player operational for a record recorded at 8-1/3 rpm.

1. Determine what occurs when any one of the following are not properly functioning

a. Electrical cord to wall outlet

b. Speaker jack or headphone jack

c. Turntable speed control

d. Volume control (power)

2. Practice putting the machine into operation while varying the conditions of 1-b, c, and d.

II. Familiarization to the experimental record
"The student should be able to . . . ."

A. Verbally relate the information found on the label of the record.

1. Read the label and state the type of information that is provided (i.e., side number and parts included).

2. Differentiate between the terms "band" and "part."

B. Place the record on the turntable within 20 seconds.

1. Practice using the record guides correctly with a minimum of three timed trials. Challenge the student to improve his time on subsequent performances.

III. Familiarization to the various capabilities of the system.
"The student should be able to . . . ."

A. Verbally specify the special features and movement characteristics of the tone arm (i.e., record edge finder, photoelectric cell, and the horizontal only movement)

B Demonstrate how each feature of the tone arm is utilized.

1. Place the needle on part one of the record using the record edge finder.

2. Activate the photoelectric cell by a light pressure on the lever at the top of the tone arm and note the auditory cue provided.

3 Move the arm horizontally across the record stating the apparent causes for changes in the signal. The lip of the lever should be used in moving the tone arm.

4. Count the audible signals on side one of the record.

5. Differentiate between the edge of the record and the actual beginning of part 1.

6. Differentiate between bands found on the record proper and the area near the center of the record.

C. Use the key to relate parts of the record to specific page numbers.

1. Discuss in general the type of information found on the key (i.e., part numbers and the ink-print pages associated with the parts) and the extent of information found on both pages of the key.

2. Using the first page of the key, state the pages of the ink-print text that are included in part 6 of the record (i.e., Pp. 401-403).

3. Using the first page of the key, state where in part 2 of the record the following page numbers would appear--at the beginning, the middle, or at the end? P. 383 and P. 380 (i.e., end and beginning, respectively).

4. Indicate which pages included in part 1 are out of order and the kind of symbol which follows those page numbers. (i.e., Pp. 388-389, asterisk).

5. Read the note found at the bottom of the second page of the key and discuss its importance in identifying study questions which are called "Reviewing the Essentials" and "Explain, Identify, or Locate" in the text.

D. Given information found on the key, use the photoelectric cell to position the needle either at the beginning, end, or middle of a specific part.

1. Given page 404, identify the part of the record where it will be located and its position within the part (i.e., part 7, beginning).

2. Given page 439, identify the part of the record where it will be located and its position within the part (i.e., part 11, end)

E. Use the fast forward-fast reverse control to determine specific locations of the ink-print page numbers within a part

1. Locate page 375 in part 1.

2. Locate page 388 in part 1.

3. Locate page 380 in part 1 by placing the needle in the second band and backing into part 1.

4. Combining skills from III-C, D, and E find page 393 and page 397 (i.e., part 4, middle; and part 4, near end, respectively)

IV. Familiarization to the foot control.*
"The student should be able to . . ."

*NOTE: 1. Orientation of the foot control--cord at toe end.

2. The power must be off when plugging the foot control into the player or when unplugging it.

3. When the foot control is engaged, the fast forward-fast reverse and pause hand controls must not be used.

A. Use the foot control for the following operations: fast forward, pause, play, and fast reverse.

B. Operate the player in locating specific page numbers using the foot control

1. Exercises for operation of foot control. Locate pages 392 in part 4 (i.e., near start); page 400 in part 5 (i.e., end); "Reviewing the Essentials" on page 423 (i.e., use key--part 8, beginning).

2. After turning off the power, practice plugging the foot control in and unplugging it. Student should be able to perform independently.

V. Familiarization to the braille supplement.
"The student should be able to . . ."

A. Discuss the types of information found in the braille supplement

1. Read the titles of supplements as found in table of contents.

2. Relate how the titles may be used to provide general information concerning the individual supplements (i.e., map, chart, graph, etc.).

3. Read portions of supplement 7-1, "Headings in Ink-Print Text." Note that the arrangement of headings is actually an outline for the unit.

   Note that the heading Geography has four subheadings: Area, Barriers to Progress, Climate,and Aids to Progress

4. Name the three supplements that provide spelling lists for countries, persons, and vocabulary of the unit, respectively (i.e., 7-2, 7-3, and 7-4, respectively). Note the alphabetical arrangement of these lists.

5. Note the nature of the supplements entitled "Reviewing the Essentials."

6. Note the nature of the supplements entitled "Explain, Identify, Locate."

7. Note the nature of supplement 7-30 "Unit Activities."

8. Note the nature of supplement 7-31 "Notes for Unit Seven."

9. Note the nature of supplement 7-32 "Selected Reading."

10. Note the nature of supplement 7-33 "Further Reading."

11. Note the nature of supplement 7-34 "Index."

B. Utilize the types of information found in the braille supplement.

1. Using the table of contents, locate the supplement which provides a time chart for Latin America (i.e., supplement 7-11).

2. Locate the supplement which is identified as a climate map of Latin America (i.e., supplement 7-9)

3. From supplement 7-1, "Headings in Ink-Print Text," name the four subheadings that are found under the heading Historical Periods (i.e., Pre-Hispanic Period to 1500 A.D.; Conquest and Colonial Era, 1500-1800; Wars of Independence, 1800-1825; and National Period Since 1825).

4. Determine the four major divisions of the unit from supplement 7-1 (i.e., Basic Facts, Politics, Economics, and Culture).

5. From supplement 7-2, spell the first word on the list and also the last (i.e., Argentina and Venezuela, respectively).

6. From supplement 7-3, spell the last name of the third person mentioned and also the last person (i.e., Balboa and Zapata, respectively).

7. From supplement 7-4, read the first entry and the next to last entry (i.e., Afro-American and vigas, respectively). Note the supplements may have multiple pages.

8. From the table of contents, determine where the study questions "Reviewing the Essentials" and "Explain, Identify, Locate") and placed in relation to major divisons of the unit (i.e., at the beginning of the major sections).

9. Discuss the purpose of providing supplements 7-30, 7-31, 7-32, and 7-33.

10. Read portions of supplement 7-34 (the index) to determine the types of information (i.e., one or more page number entries to reference additional information, correct spelling, and the nature of the entry: proper names, common nouns, and descriptive phrases).

C. Name four sections of the braille supplement that do not appear in the ink-print edition of the text.

1. Note from the table of contents that supplements 7-1 through 7-4 do not have ink-print pages listed for them.

D. Relate listening to the record to the use of the braille supplement.

1. Locate part 3, page 387. Listen to the record and tell which supplement the listener is directed to (i.e., supplement 7-12).

2. Locate part 8, page 415. Listen to the record discus "peones." Locate "peones" in the vocabulary supplement 7-4 for spelling. Did it agree with how the word was spelled on the record?" Locate the term "peones" in the index and determine if other references are available (i.e., Pp. 401, 403, and 418-419).

E. Relate information in the supplements to information on the record.

1. Use the index to locate pages where information may be found on the following:

   a. Audiencias (i.e., P. 393)

   b. Dwight D. Eisenhower (i.e., P. 404)

2. Use the supplement of headings to find material on Politics of Latin America, specifically Present State of Politics (i.e., P. 389, part 4).

3. Use the supplement of headings to find material on "The Wars of Independence which is a subheading of Historical Periods (i.e., P. 387, part 3).

F. Note that the supplements containing study questions ("Reviewing the Essentials" and "Explain, Identify, Locate" are both written as supplements and recorded.

1. Use the key to confirm that the study questions appearing on pages 406 and 407 will be found in part 3 of the record; then note from the braille supplement's table of contents that these study questions also can be found as written supplements (i.e., 7-13 and 7-14).

2. Find "Reviewing the Essentials" referred to in F-1 both on the record and in the braille supplement (i.e., Pp. 406-407, part 3 and supplement 7-13, respectively).

APPENDIX E

STUDY TASKS

Day 1

Aural Study Systems for the Visually Handicapped

Equipment and Materials Evaluation

Practice Study Questions

1. What kind of government is found in Uruguay? [democratic]

   page 391 (Part 4--Pp. 389-398)--line 7 (21" into page)

2. What was a central theme of Fidel Castro's revolution in Cuba? [redistribution of foreign-owned property]

   page 406 (part 7--Pp. 404-406)--line 38 (1'47" into page)

3. During what years was Juan Domingo Peron dictator of Argentina? [1943 to 1955]

   page 391 (part 4--Pp. 389-398)--line 36 (1'37" into page)

4. What were cabildos? [town councils (theoretically elected)]

   page 393 (part 4--Pp. 389-398)--line 18 (1'03" into page)

5. Define peninsulares. [Latin-American whites born in Europe (during the Colonial period)]

   page 395 (part 4--Pp. 389-398)--line 29 (1'15" into page)

NOTE-Alternate using hand controls and foot control. Give any assistance needed.

Day 2
Day 3, if necessary

Aural Study Systems for the Visually Handicapped

Equipment and Materials Evaluation

Study Questions for Test

1. Define Ladinos. [upper class Spanish--speaking people of Guatemala]

   page 382 (part 2--Pp. 380-383)--line 11 (28" into page)

2. What did U.S. President Woodrow Wilson seek to promote in Latin America? [democracy]

   page 404 (part 7--Pp. 404-406)--line 22 (1'08" into page)

3. How does the per capita income of Anglo-Americans compare with the per capita income of Latin-Americans, today? [between three and 30 times higher]

   page 417 (part 9--Pp. 417-423)--line 20 (56" into page)

4. What was the military rank of Porfirio Diaz? [general]

   page 401 (part 6--Pp. 401-403)--line 18 (56"-66" into page)

ALTERNATE QUESTION Who was Philip II? [absolute monarch of the Spanish Empire (during the latter part of the 16th century)]

page 392 (part 4--Pp. 389-398)--line 30 (1'22" into page)

NOTE--Give no assistance other than with index; note where required.
Stop after 10 minutes if task is not completed.

Day 3

Aural Study Systems for the Visually Handicapped

Equipment and Materials Evaluation

two quotations to be copied--one using the hand controls and the other using the foot control--the condition being alternated for the tasks between subjects as specified

Locate and copy the first part of Bolivar's quotation which is found on page 397. Page 397 will be found in part four of the record which starts with page 389 and ends with page 398.

[starts on line 36 (1'28" into page)--46 words (78 syllables)]]

"The President of the Republic becomes in our Constitution the sun,, which, firm in the center, gives life to the universe . . . This supreme authority should be perpetual . . . a life-term President with the power of naming his successor is the most sublime additiom to the republican system."

Locate and copy the quotation found on page 421 concerning how Latin-American tradition has worked against the people learning the scientific and technological skills needed for economic development. Page 421 will be found in part nine of the record which starts with page 417 and ends with page 423.

[starts on line 25 (59" into page)--45 words (86 syllables)]

"some Latin American leaders don't want technological change," and that "those people with the maximum status, dignity, power, and influence in Latin-American society have not seen fit to spend their time and money in studying science, technology, and administration for adaptation to their own cultures."

NOTE--Locating pages within parts 4 and 9 should present no difficulties as all pages included in these parts are in numerical order.

Assistance locating the quotations may be given but note where it was needed.

Stop after 14 minutes if the task is not completed.

Aural Study Systems for the Visually Handicapped

Equipment and Materials Evaluation

Other Study Tasks

Outlining Task

Outline the results of the Mexican Revolution of 1910.

** An outline is a brief list of words or phrases that would help you remember the main thoughts of the section.

Directions: Results of the revolution are described in several sections that begin with the topic heading Land Reform. You can locate this starting point by placing the needle at the beginning of part 6 and using the fast forward until P. 402 is announced. The section Land Reform will follow shortly after. (part 6--Pp. 401-403)

** Only if the S asks how to outline or what an outline is.

Summarizing Task

Summarize the section that follows the heading "Revolution of Rising Expectations."

** In a few of your own words write out the main ideas of the section.

Directions: Begin your listening on P. 421, which is located in part 9. You may be interested in knowing that pages 417 through 423 are recorded in part 9. You are looking for P. 421.

** Only if the S asks the nature of a summary.

NOTE--Assistance locating the place may be given but note where it was needed.

Stop after 16 minutes if the task is not completed.

APPENDIX F

SUBJECT DATA SHEET

Subject Data Sheet

Aural Study Systems for the Visually Handicapped
Equipment and Materials Evaluation
Study Tasks

NAME _____ GRADE _____ SEX _____

SCHOOL _____ DATE _____

DAY ONE--PRACTICE STUDY QUESTIONS

1. hand/foot time required: to locate _____ to complete task (cum) _____

   comments:

2. hand/foot time required: to locate _____ to complete task (cum.) _____

   comments:

3. hand/foot time required: to locate _____ to complete task (cum.) _____

   comments:

4. hand/foot time required: to locate _____ to complete task (cum.) _____

   comments:

5. hand/foot time required: to locate _____ to complete task (cum.) _____

   comments:

General Comments:

DAY TWO--STUDY QUESTIONS

Presentation order No. _____

1. hand/foot time required: to locate _____ to complete task (cum.) _____

   comments:

2. hand/foot time required: to locate _____ to complete task (cum.) _____

   comments:

3. hand/foot time required: to locate _____ to complete task (cum.) _____

   comments:

4. hand/foot time required: to locate _____ to complete task (cum.) _____

   comments:

Preference: hand controls/foot control

General Comments:

DAY THREE--COPYING TASKS

1. hand/foot time required to locate _____

   any assistance required to locate:

   time to copy _____

   strategy used:

   Did student check work?

   comments:

2. hand/foot time required to locate _____

   any assistance required to locate:

   time to copy _____

   strategy used:

   Did student check work?

   comments:

Preference: hand controls/foot control

General Comments:

DAY FOUR--OTHER STUDY TASKS

Outlining Task

hand/foot time required to locate _____

any assistance required to locate:

total time required to listen and complete task (from next page) _____

strategy used:

After completing task does S recheck work or relisten to confirm answer?

comments:

Summarizing Task

hand/foot time required to locate _____

any assistance required to locate:

total time required to listen and complete task (from next page) _____

strategy used:

After completing task does S recheck work or relisten to confirm answer?

comments:

Preference: hand controls/foot control

General Comments:

Record of How Time is Used Performing Day Four Tasks

Outlining Task			Summarizing Task	
listening to message (sec.)	writing etc. (sec.)		listening to message (sec.)	writing etc. (sec.)
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____		_____	_____
_____	_____	----part times----	_____	_____
_____	_____	-mean time of parts-	_____	_____
_____		----total time----	_____	